Index

Nuclear Safety

Volume 7

Note: The page range for each of the four issues of Vol. 7 is as follows: No. 1, pages 1 to 136; No. 2, pages 137 to 270; No. 3, pages 271 to 408; and No. 4, pages 409 to 522.

A

Accelerators
  operation at University of Virginia, 296
Accidents
  AEC operations, 495-96
  analysis, 20-44, 162-74, 249-50, 302-23
  analysis in fast sodium reactors, 405-6
  analysis in light-water reactors, 400-1, 501
  burnout in boiling heat transfer, 436-43
  control rod sticking in reactors, 51
  critical assembly in Yugoslavia, 281
  depressurization of G2 Reactor, 280
  emergency procedures at CVTR, 146-48
  evaluation of reactor, 279-92
  explosions, 172
  fast reactor meltdown, 424-35
  fires, 172
  fission break at ETR, 280
  fission-product release, 34-42, 203-4, 253
  fuel-element meltdown in HTRE-3, 280
  fuel failure in ORR, 280
  instrumentation, diagnostic, 329
  maximum credible, in reactors, 82-83
  metal–water reactions, 25-34, 400
  moderator loss in Piqua Reactor, 50
  NRX Reactor, 281
  Power Burst Facility, 447
  power excursion in SRE, 280-81
  probability estimation of reactor, 329
  radiation, in CVTR, 145-46
  radioactivity release, consequences of, 89-103, 218-35, 354-74
  radioiodine behavior in Windscale Reactor, 72
  reactor excursion, analysis of, 33
  reactor excursion containment, 459-68
  reactor-fuel failure, vented, 506
  reactor-fuel storage areas, irradiated, 69-72
  reactor loss-of-coolant, 29, 33-34, 50-51
  reactor power excursion simulation, 20-25
  reactor pressure-vessel failure, 435-36
  reactors in U. K., 152
  recovery, 329, 408, 509
  Saxton Reactor, 50
  sequence of reactor, 280-81
  SPERT program, 443-48
  superheater failure in BONUS, 113-18
  tritium uptake by personnel in NPD Reactor, 113
  Yankee Reactor, 50
Actinide elements
  fire extinguishing, 172
Adsorbers
  ignition of charcoal, by fission-product decay heat, 253
Advisory Committee on Reactor Safeguards
  engineered safeguards, applicability of, 343
  functions, 119-20, 122
  membership, 384
Advisory Panel on Accelerator Radiation Safety
  functions and membership, 384-85
Aerosol Development Facility
  operation, 254-55
Aerosols
  (see also Fission products)
  agglomeration, 502
  filtering, 502-3
  properties, 501-2
Air
  (see also Atmosphere)
  cleaning, 252, 343, 403-4
  leakage through reactor containment components, 404
  methyl iodide removal from, 503
  radiation monitoring, 55-56, 70, 403
  radioisotope behavior in, 406-7
  sampling, 55-56
Air mixtures (air-steam)
  methyl iodide removal from, 502
Alkali metals
  concentration in plants, 93
Alloys
  reactions with water, 27-30
Aluminum
  reaction with steam, 30-33
  sorption of radioiodine, 76
Aluminum alloy reactor fuels (Al–Ni–U)
  reaction with steam, 30-31
Aluminum alloy reactor fuels (Al–Ni–U) (irradiated)
  reaction with water, 32
Aluminum alloy reactor fuels (Al–U)
  reaction with water, 32
Aluminum alloy reactor fuels (Al–U) (irradiated)
  radioiodine release, 76
Aluminum alloys (6061)
  reaction with steam, 30-31
  reaction with water, 32
Aluminum powder
  ignition, 171
Aluminum system reactor fuels ($Al–U_3O_8$)
  ignition, 170
American Conference of Governmental Industrial Hygienists
  contaminants, threshold limits for atmospheric, 89-92
American Industrial Hygiene Association Hygienic Guides Series, 91
American Standards Association
  contaminants, threshold limits for atmospheric, 89-92
Animals
  (see also Rodents)
  radiation effects on populations, 97
  radioisotope cycling in systems of, 95
Argon-41
  hazards in NPD Reactor, 112
Argonne National Laboratory
  administration of nuclear safety, 1-6
Atmosphere
  (see also Air)
  contaminant threshold limits in industrial hygiene, 89-92
  dispersion in, 364-65
  precipitation scavenging of gases and particulates from, 354-64
Atomic Disposal Company
  licensing and regulation of waste storage facility, 264-65
Atomic Energy Commission
  accidents in operations, 495-96
  administrative activities, 118-22, 384-85, 510-11
  reactor design criteria, 416-17
  Rules of Practice, 395-96
Automation
  operational aspects, 328-29

B

Beryllium
  oxidation, 171
Beryllium intermetallic compounds
  oxidation, 171
Beryllium neutron sources (Be–Pu)
  licensing guide, 270
Beryllium powder
  ignition, 171
Bioassay
  program at CVTR, 140-41
Boiling burnout, 436-43
Boron

use in power reactor secondary shutdown systems, 49-50
Boron carbide powder
ignition, 171
Boron powder
ignition, 171
Bromides
concentration in plants, 93
Brookhaven Chemo-Nuclear In-Pile Research Loop, 165, 167-68
Burnout (boiling), 436-43
By-product material
licensing and regulation, 132-34

C

Calcium-45
cycling in ecosystems, 94
use in rodent population studies, 96-97
Calcium-47
cycling in ecosystems, 95
Calcium fluoride (irradiated)
defect traps, 36
Calcium powder
ignition, 171
California
standards for atmospheric pollution, 91
Cancer
radiation induction, 477-78
Capsule Driver Core
reactivity insertions, 498
use in SPERT-IV, 251
Carbon-14
levels in plants, 95
Carbon coatings (pyrolytic)
fission-gas retention, 311
Carbon dioxide
compatibility with metallic reactor fuels, 303
Carbon monoxide
threshold limits in atmosphere, 90
Cerium powder
ignition, 171
Cesium
cycling in ecosystems, 95
release from UO_2, 501
Cesium-137
contamination by, protective guides for environmental, 413-15
cycling in ecosystems, 94-95
effects on lizard population, 97
measurements of, environmental, 229-30
release at high temperature, 248
retention by plants, 94-95
transport in model river, 255
uptake from soils by plants, 93
Cesium radioisotopes
reactions with soil minerals, 99-100
Charcoal
sorption of radioiodine, 75-76
Charcoal adsorbers
ignition of, by fission-product decay heat, 253
Chemical plants
licensing, 131-32, 300-1
Chlorides
concentration in plants, 93
Chlorine radioisotopes
detection in environs, 93
Chromium boride powder
ignition, 171
Chromium carbide powder
ignition, 171
Chromium powder
ignition, 171
Clays
reactions of minerals in, with radiostrontium, 99-102
Climatology (precipitation)
scavenging theory, 361-62
Clinch River
population radiation dose from wastes in, 256
Cobalt powder
ignition, 171
Code of Federal Regulations
engineered safeguard criteria, 82
reactor site evaluation, 73
Codes
national and international, 415-17
Columbia River
analysis for radioisotopes, 256
radioisotope behavior in, 408
Compensation (workmen's)
for radiation injuries, 510-11
Computer programs
fast sodium reactor transients, 506
fission-product release, 505
LOFT program, 504
reactor accident analyses, 501
SPERT, 251-52, 498-99
Computers
use in reactor control, 153, 329-30, 452, 456-58
use in reactor-core meltdown experiments, 430-31
Concrete
sorption of radioiodine, 75-76
Conferences
health physics, 370-74
instrumentation, 328-33
nuclear electronics, 449-52
reactor operation, 148-58
Containers (shipping)
analysis, 249
integrity, 248-49
Containment-Systems Experiment
progress, 254-55, 503
Contamination
(see also Decontamination, Materials (radioactive), and Pollutants)
levels at CVTR, allowable, 141-42
methods and equipment, 505
protective guides for environmental, 413-15
PRTR after rupture-loop failure, 245
threshold limits for atmospheric, 89-92
water system backflow prevention at ORNL, 333-36
Contracts
appeals, 396
Control, 45-66, 175-84, 324-37
(see also Reactor control)
Copper
sorption of radioiodine, 75-76
Copper powder
ignition, 171
Corrosion
mild steel in HWCTR cooling system, 154
Cows
^{131}I ingestion by, 366-67, 405
Critical assemblies
(see also Reactors)
control using moderator level, 154
radiation accident in Yugoslavia, 281
safety at ANL, 3-4
Criticality
control at CVTR, 144-45
reactor fuel storage areas, irradiated, 69-72
U systems, H_2-moderated, 418-23
Criticality Hazards Control Committee
functions and purposes at ANL, 2-6
Criticality incidents
(see Accidents)
Cryogenic materials
burnout with, 438

D

Decontamination
(see also Contamination)
hot cells, 212-14
Deposition (dry), 365-66
Design
reactor containment systems, 81-86, 194
reactor cores, 153-54
reactor experience and requirements, 157
reactor piping systems, 187, 191-92
reactor safety systems, 153, 175-76
Deuterium oxide
(see Heavy water)
Diffusion boards
use in reactor containment systems, 77
Doppler effect, 251, 313-18, 399, 499
Dosimeters
use, 222-25
Dosimetry
for accidents, 218-25
Dry deposition, 365-66
Dusts
threshold limits in atmosphere, 89

E

Ecology (radiation)
terrestrial, 92-99
Economics
health and safety program at CVTR, 148
Effluents (gaseous)
radiation monitoring, 332
radioiodine washout from, 359-60
Electronics (nuclear)
conference, 449-52
Engineered safeguards
effects on reactor siting, 342-46
reactor containment systems, 76-78, 81-86
Engineering (human)
reactor control and instrumentation systems, 333
Excursions
(see Accidents)
Explosions, 172
containment in reactor vessels, 459-68

F

Fallout
concentrations of radioisotopes from, in environs, 95-96
retention by plants, 93-94
Federal Radiation Council
guides for environmental contamination protective action, 413-15
Fertility
reduction by irradiation, 478
Film badges
use at CVTR, 142
Filters
evaluation, 403-4, 502-3
use for air monitoring and sampling, 55-56
use in reactor containment systems, 77-78
Fires, 172
Na, fission-product release from, 252
Fission counters
limitations, remedies for, 181-82
Fission gases

(see also Fission products and Radioisotopes)
release from irradiated ThO_2–UO_2 reactor fuels, 305
release from irradiated UO_2 reactor fuels, 304-5
release from irradiated UN reactor fuels, 309
retention by PyC, SiC, and ZrC coatings, 311
Fission products
(see also Aerosols, Fission gases, and Radioisotopes)
behavior in gas-cooled reactors, 406, 507
behavior in light-water reactors, 401-4
behavior in Na, 253
deposition on reactor containment vessel wall surfaces, 254
determination, 505
ignition of charcoal adsorbers by decay heat of, 253
release, 203-4, 252-54, 501-2, 505
release from burning Na, 252
release from failed PRTR fuel, 158
release at high temperatures, 248
release from irradiated reactor fuels, 252-53
release from irradiated SS-UO_2 fuel in BORAX-V, 157-58
release from irradiated UO_2 reactor fuels, 34-42, 501-2
release from Na, 506-7
removal, 252-54
removal from reactor containment atmosphere, 76-78
retention by reactor coolants, 252, 406, 506
retention by reactor-fuel coatings, 311
transport, 203-4, 252-54
Foam
use in reactor containment systems, 77
France
reactor power excursion simulation, 20-25

G

Gadolinium
use in Savannah River production reactors in secondary shutdown systems, 49
Gadolinium nitrate
use as poison in Savannah River reactors, 153-54, 175-79
Gas-Cooled Reactor–Oak Ridge Research Reactor Loop 2, 165-69
Gases
behavior of radioactive, in ground, 407-8
fission product removal from reactor containment, 76-78
precipitation scavenging from atmosphere, 354-64
radiation monitoring of effluents, 332
threshold limits for toxic, in atmosphere, 90
General Atomic In-Pile Loop, 166-69
Geohydrology
radioisotope behavior, 407-8, 508
Graphite
annealing in BGRR, 155
expansion in Hallam Reactor moderator elements, 240-41
oxidation, 170-71
sorption of radioiodine, 76
Graphite (irradiated)
defect traps, 36
oxidation, 170, 254
properties, 318-23
Ground
radioisotope behavior in, 256, 407-8, 508

H

Handling
materials, radioactive, 248, 294-96
reactor fuels, irradiated, 69
solid wastes, 231-34
Hanford Atomic Products Operation
operation, 151-52
Hanford, Washington
radiation monitoring of waste releases, environmental, 230
Health physics
conference, 370-74
CVTR, 138-39
radiation exposure records, 6-11
Heat transfer
burnout in boiling, 436-43
Heavy water
dumping for reactor shutdown, 49, 51
inventory of coolant, in NPD Reactor, 110
loss from CVTR, 382
Helium
cover gas system performance in NPD Reactor, 110
Hospitals
radioactive material handling and disposal in, 474-76
Hot cells
decontamination, 212-14
Human beings
^{137}Cs uptake by, 95
medical aspects following radiation exposure, 223
radiation dosage, estimates of, 372-73
radiation dosage in Hallam Reactor, 241
radiation dosage in NPD Reactor, 113
radiation dosage to thyroid from ^{131}I in ingested milk, 367-70
radiation dosage from wastes in Clinch River, 256
radiation effects on, 12-14, 476-80
radiation exposure, 371, 373, 491, 510
radiation monitoring, 331, 494
uptake of radioisotopes, 96, 470-71
uptake of tritium in NPD Reactor, 113
workmen's compensation for radiation injuries, 510-11
Human engineering
reactor control and instrumentation systems, 333
Hydrology (geo-)
radioisotope behavior, 407-8, 508
Hygiene (industrial)
contaminants, threshold limits for atmospheric, 89-92

I

Incidents
(see Accidents)
Industry
contaminants, threshold limits for atmospheric, 89-92
radiography licensing guide, 270
Insects
radiation effects on populations, 97
radioisotope cycling in systems of, 95
uptake of radioisotopes, 96
Inspection
reactor fuel storage areas, irradiated, 69-70
Instrumentation, 45-66, 175-84, 324-37
(see also Reactor instrumentation)
for radiation detection in irradiated reactor fuel storage areas, 69-70
Insurance, 266-67
indemnification of reactor licensees, 122, 124
International Commission on Radiological Protection
radiation dose, daily permissible, 13
recommendations regarding radioactive materials, 474-76
Iodine
diffusion in UC, 253, 502
Iodine-131
air monitoring and sampling for, 55-56
behavior in ground, 256
content in milk, prediction of, 364-70
ingestion by cows, 366-67, 405
measurements of, environmental, 230
retention by plants, 94
uptake by plants, 96
Iodine compounds
formation of organic, in reactor containment systems, 75
Iodine radioisotopes
activity peaking in Elk River Reactor primary coolant, 493-94
behavior in reactor-containment systems, 72-80
determination in reactor coolant, 158
diffusion in UC, 253, 502
release in Containment-Systems Experiment, 255
release from irradiated reactor fuels, 253, 502
release from reactors, 345
removal from reactor-containment systems, 72-80
retention by Na, 252
washout from stack gases, 359-60
Ionization chambers
gamma compensation for, 179-81
Iron alloy reactor fuels (Fe–Pu–U)
ignition, 169
Iron boride powder
ignition, 171
Iron carbide powder
ignition, 171
Iron powder
ignition, 171

K

Krypton-85
air monitoring and sampling for, 56

L

Law
radiation exposure records, 6-11
Leaks
testing for, in reactor containment systems, 194-203
Liability insurance, 266-67
Licensing and regulation
(see also Code of Federal Regulations and Regulations)
AEC administrative activities, 118-22, 384-85
AEC Rules of Practice, 395-96
Big Rock Point Reactor, 126, 258, 386, 514
BONUS Reactor, 124, 126, 258, 260-61, 385-86, 388, 513-14, 516-17
Brookwood 1 Reactor, 258, 261, 386,

514, 517-18
by-product material, 132-34
changes, 132-34, 265-66, 395-97, 521-22
chemical plants, 131-32, 300-1
Colorado HTGR, 259, 261
Connecticut Yankee Reactor, 126, 258, 386, 514
contract appeals, 396
CVTR, 125-26, 137-38, 258, 261, 386, 388, 514
Dresden 1 Reactor, 126, 258, 261, 386, 514
Dresden 2 Reactor, 126, 258, 261-62, 386, 388-89, 514
Dresden 3 Reactor, 389, 514
EBR-II, 126, 258, 386, 514
EBWR, 126, 258, 386, 514
EGCR, 126, 258, 386, 389
Elk River Reactor, 126, 258, 386, 514
Fermi Reactor, 125-26, 258, 262, 386, 389, 514
GETR, 125, 128, 389-90, 518
guides, 270, 301
Hallam Reactor, 126, 128, 258, 386, 514
HFBR, 262-63
HFIR, 128
Humboldt Bay Reactor, 126, 128-29, 258, 263, 386, 390, 514, 518
Indian Point Reactor, 126, 129, 258, 263
Indian Point 1 Reactor, 386, 514
Indian Point 2 Reactor, 390, 514, 518
insurance, 266-67
La Crosse Reactor, 127, 259, 386, 514
Malibu Reactor, 126, 129-30, 259, 387, 514
Millstone Point Reactor, 130, 258, 263-64, 387, 515, 518-19
New Hampshire authority, 397
New Production Reactor, 127, 259, 387, 515
Nine Mile Point Reactor, 127, 259, 387, 515
N. S. Savannah, 127, 130, 259, 387, 391, 515
Oregon, 134
Oyster Creek Reactor, 127, 259, 387, 515
Pathfinder Reactor, 127, 130-31, 259, 264, 387, 391-92, 515
Peach Bottom Reactor, 127, 259, 264, 387, 392, 515
Piqua Reactor, 127, 131, 259, 387, 392, 515
Platteville Reactor, 387, 515
Puerto Rico Nuclear Center Reactor, 392-93
PWR, 127, 259, 387, 515
radioactive materials, transport of, 396-97
reactor fuel reprocessing plants, 131-32, 511
reactor operators, 297-301
rules of practice, 266
San Onofre Reactor, 127, 259, 264, 387, 515
Saxton Reactor, 127, 131, 259, 387, 515
SEFOR, 127, 131, 259, 387, 393-94, 515
source material, 134
special nuclear material, 266
SRE, 127, 259, 387, 515
Tennessee, 134
Turkey Point 3 Reactor, 519
Turkey Point 4 Reactor, 519
University of Virginia research reactor, 294-95
VESR, 127, 259, 264, 387, 394, 515
waste storage facility at Atomic Disposal Co., 264-65
Yankee Reactor, 127, 259, 387, 515, 519-20
Lithium powder
ignition, 171

M

Magnesium
ignition, 171
sorption of radioiodine, 76
Magnesium alloys (Mg–Mn–Zr)
ignition, 171
Magnesium alloys (Mg–Th)
licensing guide for processing, 270
Magnesium alloys (Mg–Zr)
ignition, 171
Magnesium powder
ignition, 171
Magnox A.12
ignition, 171
Manganese-54
retention by plants, 95
Manganese alloys (Mg–Mn–Zr)
ignition, 171
Manganese powder
ignition, 171
Manufacturing Chemists Association
guides, industrial hygiene, 90
Materials (by-product)
licensing and regulation, 132-34
Materials (cryogenic)
burnout with, 438
Materials (fissionable)
handling at ANL, 4-6
Materials (irradiated)
defect traps, 36
Materials (radioactive)
(see also Contamination and Wastes)
control at CVTR, 143
disposal, 474-76
handling, 248, 294-96, 474-76
release, consequences of, 89-102
shipping, 248, 396-97, 406, 409-13
Materials (source)
licensing and regulation, 134
Material (special nuclear)
licensing and regulation, 266, 521-22
Medicine
licensing guide for programs, 270
research, radioactive materials in, 474-76
treatment following radiation exposure, 223
Metals
reactions with water, 25-34, 400
Metals (alkali)
concentration in plants, 93
Metals (liquid)
burnout, 437-38
Metals (structural)
oxidation, 171
Methyl iodide
formation of, in reactor containment systems, 75
removal from gases, 502-3
Methyl iodide (irradiated)
decomposition, 253, 502
Milk
^{131}I in, prediction of, 364-70
Minerals
reactions with radiocesium, 99-100
reactions with radiostrontium, 99-102
Misch metal powder
ignition, 171
Mixtures
burnout in, 437
Molybdenum
oxidation, 171
Molybdenum alloy reactor fuels (Mo–Pu–U)
ignition, 169
Molybdenum alloy reactor fuels (Mo–U) (irradiated)
swelling, 303
Molybdenum boride powder
ignition, 171
Molybdenum carbide powder
ignition, 171
Molybdenum powder
ignition, 171

N

National Reactor Testing Station
operation, 511
radioactive gas behavior in lithosphere, 407-8
National Safety Council
guides, industrial hygiene, 90
Neutron detectors
design, 449, 451
reactor in-core, 329-31
uses, 153, 429-30, 449, 451
Neutron flux
measurement, 179-84, 332-33, 451
noise in reactors, 453-55
Neutron monitors
in-core, for power reactors, 182-84
Neutron-source tubes
description, 332
Neutrons (pulsed)
spatial effects in experiments, 163-64
New Hampshire
regulatory authority, 397
Nickel alloy reactor fuels (Al–Ni–U)
reaction with steam, 30-31
Nickel alloy reactor fuels (Al–Ni–U) (irradiated)
reaction with water, 32
Nickel boride powder
ignition, 171
Nickel carbide powder
ignition, 171
Nickel powder
ignition, 171
Niobium
oxidation, 171
Niobium beryllide
oxidation, 171
Niobium boride powder
ignition, 171
Niobium carbide powder
ignition, 171
Niobium powder
ignition, 171
Nitrosylruthenium dinitro
solution chemistry in aqueous environment, 408
Nozzles
in spherical shells, 255, 400, 500
Nuclear electronics
conference, 449-52
Nuclear excursions
(see Accidents)
Nuclear facilities
containment, 254-55
Nuclear material
licensing and regulation of special, 266
Nuclear Safety Information Center
activities, 136, 509
selective dissemination of information, 248
Nuclear Safety Pilot Plant
fission-product release studies, 502
progress, 402
reactor fuel meltdown in, 253-54

Nuclear transducers
review, 179-84

O

Oak Ridge Gaseous Diffusion Plant
power systems, emergency, 326
Oak Ridge National Laboratory
water system backflow prevention, 333-36
Oregon
regulatory authority, 134
Oxygen
recombination in PRTR, 154

P

Paints
sorption of radioiodine, 76
Particle accelerators
operation at University of Virginia, 296
Particulates (radioactive)
precipitation scavenging from atmosphere, 354-64
Personnel
(see Human beings)
Phosphorus-32
cycling in ecosystem, 94
detection in environs, 93
Phosphorus-33
detection in environs, 93
Photography
use in reactor-core meltdown experiments, 429
Plants
concentrations of fallout radioisotopes in, 95-96
power supplies for nuclear, 324-28
radiation effects on populations, 98
radiation exposure in environs of nuclear, 371
radiation monitoring of gaseous effluents from nuclear, 332
radioisotope cycling in systems of, 94
retention of fallout, 93-94
uptake of radioisotopes, 93-94, 96
water system backflow prevention at ORNL, 333-36
Plastics
sorption of radioiodine, 76
Plumes
depletion, 365
Plutonium
fire extinguishing, 172
ignition temperature, 469
licensing guide for processing, 270
oxidation, 172, 469-70
release control during spent reactor fuel reprocessing, 255-56
Plutonium-239
handling at ANL, 5
Plutonium alloy reactor fuels (Fe–Pu–U)
ignition, 169
Plutonium alloy reactor fuels (Mo–Pu–U)
ignition, 169
Plutonium alloys
ignition temperatures and oxidation rates, 469
Plutonium alpha sources
licensing guide, 270
Plutonium dioxide particles
production, 469-70
Plutonium dioxide system reactor fuels (PuO_2–UO_2)
development, 306-7
oxidation, particle production by, 470
response to power excursions, 250-51
thermal conductivity, 306
venting, 254, 307
Plutonium monocarbide system reactor fuels (PuC–UC)
venting, 307
Plutonium monocarbide system reactor fuels (PuC-UC)(irradiated)
behavior and thermal conductivity, 308
Plutonium neutron sources (Be–Pu)
licensing guide, 270
Plutonium oxide reactor fuels
aerosols formed upon vaporization of, 253
Plutonium particles
hazards of dispersed, 468-73
Pollutants
(see also Contamination)
dispersion from quasi-instantaneous sources, 225-29
Potassium
cycling in ecosystems, 94-95
Power (spatial)
distribution in power reactors, 457-58
Power supplies
for nuclear facilities, 324-28
Precipitation
scavenging of gases and particulates from atmosphere by, 354-64
Pulsed neutron experiments
spatial effects in, 163-64
Pumps
operation of Na, in Hallam Reactor, 239-40
performance in ATR, 155
Pyrolytic carbon coatings
fission-gas retention, 311

R

Radiation
(see also Accidents)
hazards in environment, 97
Radiation (gamma)
levels in NPD Reactor, 112-13
Radiation counters
use of whole-body, for environmental monitoring, 229-31
Radiation-detection instrumentation
CVTR, 142-43
design, 449, 451
operation in Elk River Reactor, 495
reactor fuel storage areas, irradiated, 69-70
use, 449, 451
Radiation dosage
daily permissible, 13
estimates of, to human beings, 372-73
to human thyroid from ^{131}I in ingested milk, 367-70
medical treatment relation to, 223
personnel in Hallam Reactor, 241
personnel in NPD Reactor, 113
to population from wastes in Clinch River, 256
Radiation dosimeters
use, 222-25
Radiation dosimetry
for accidents, 218-25
Radiation ecology
terrestrial, 92-99
Radiation effects
(see also Reactor fuels)
animal populations, 97
biological, 476-80
CH_3I, decomposition of, 253
fuel in Fast Ceramic Reactor, 509
graphite, 318-23
graphite, defect traps in, 36
graphite, oxidation of, 170, 254
insect populations, 97
medical, 476-80
plant populations, 98
society, 11-18
steel (A-212B), 500
U, ignition of, 169
vessel in PM-2A Reactor, 500
Radiation exposure
CVTR, 140-42, 145-46
Elk River Reactor, 491
following radioisotope release, 373
medical treatment following, 223
nuclear facility environs, 371
records, 6-11, 510
Radiation injuries
workmen's compensation for, 510-11
Radiation levels
in BONUS accident, 115-16
in Elk River Reactor, 491-92
Radiation monitoring
air, 55-56, 70, 403
CVTR, 142-43
Elk River Reactor, 492-94
environs, 371-72
for failed reactor fuel, 331-32
gaseous effluents, 332
guide, 508-9
personnel, 331, 494
power reactors, 408
PRTR during shutdown, 158
use of whole-body counters for environmental, 229-31
wastes, 52-56
Radiation protection
instrumentation at CVTR, 142-43
standards, 132, 160
Radiation safety
CVTR, 137-48
University of Virginia, 292-96
Radiation shielding
for in-pile loops, 167-68
Radioactivity
decay of neutron-induced, in soils, 96
release, consequences of, 89-103, 218-35, 354-74, 474-81
release from Hallam Reactor waste-disposal system, 241
standards in U.S.S.R., 160
Radiobiology, 476-80
Radiography
licensing guide for industrial, 270
Radioisotopes
(see also Materials (radioactive))
behavior in environment, 255-57, 406-8, 508
cycling in ecosystems, 94-95
handling at University of Virginia, 294-96
origin of environmental, 93
protective guides for environmental contamination by, 413-15
release at Elk River Reactor, 492-93
release in environment, 255-57, 373
retention by plants, 93-94
in soils, 93-94
toxicity, 474
uptake by insects, 96
uptake of natural, by human beings, 96
Radium-228
uptake by human beings, 96
Rain
washout by, 355-60
Rainout, 360-61
Reactivity
control in power reactors, 457
core in Hallam Reactor, 241-42
NPD Reactor, 110-11
Reactivity Accident Test

program, 499
Reactivity worth
Gd(NO3)3 poison solution in Savannah River reactors, 176
Reactor cold traps
SRE, 153
Reactor components
special, for reactor operation, 153-54
Reactor containment, 254-55
Containment Research Installation development, 505
Containment Systems Experiment, 503
engineered safeguards, 76-78, 81-86
explosions, 459-68
failure in Yankee Reactor pressure vessel, 519-20
fission-product deposition on walls, 254
irradiation testing of vessels, 399-400
leak testing, 194-203
light-water reactors, 404
methyl iodide removal from atmospheres, 503
nozzles in spherical shells, 255, 400, 500
openings in pressure vessels, reinforced, 255, 400, 500-1
power reactors, 83-86
pressure in LOFT tests, 504
pressure-vessel integrity, 509
pressure-vessel technology, 435-36
radioiodine release, transport, and deposition in, 72-80
secondary, for in-pile loops, 166-67
steel shells, strength of, 204-12, 346-53
systems, 343
testing of BBRR, EBR-II, and Saxton, 155
vessel fatigue, 500
vessel irradiation testing, 500
vessel performance in Elk River Reactor, 484
Reactor control, 45-62, 175-84, 324-33, 449-58
B injection in Elk River Reactor, 486
computer use in, 153, 329-30, 452, 456-58
failure in SPERT-III, 157
for in-pile loops, 168
HFIR, 329
human engineering, 333
instrumentation, 153
neutron flux measurement, 332-33
NPD Reactor, 104, 106-7, 112
reliability, 329
Reactor control rod drives
inspection in Elk River Reactor, 486
testing, 57-62
Reactor control rods
calibration, 155-56, 484-85
Elk River Reactor, 484-86
failure in EBR-II, 159
faults in U. K., 291
release in French gas-cooled reactors, 49
release in U. K. gas-cooled reactors, 49-50
spring-actuated, in ASTR, 154
sticking in accidents, 51
thimble failure in Hallam Reactor, 240
vibration reduction in GETR, 158
Reactor coolants
(see also Reactors (Loss of Fluid Test))
analysis for I radioisotopes, 158
compatibility with metallic reactor fuels, 303
D2O inventory in NPD Reactor, 110
decompression effects of pressurized water, 400, 501
fission-product behavior in Na, 253
fission-product release from Na, 252, 506-7
fission-product retention, 252, 406, 506
loss, 26, 29, 50-51, 382
radioiodine peaking in Elk River Reactor, 483-94
Na boiling, 251, 405, 506
Na burning, 172, 252, 405-6
Na reactions, 405-6
tritium levels in Elk River Reactor, 492
Reactor cooling systems
blowdown, 504-5
component performance in SRE, 157
corrosion of mild steel in HWCTR, 154
failure in NPD Reactor, 107
for in-pile loops, 168-69
piping rupture, 185-94, 249, 399
pump performance in ATR, 155
pump performance in Hallam Reactor, 239-40
pump performance in NPD Reactor, 109
spray use, 338-43
testing of ATR, prestartup, 155
Reactor cores
Capsule-Driver, 251, 445, 447, 498
characteristics in Elk River Reactor, 486
design, 153-54
Doppler feedback in SPERT-I, 499
dynamics in fast sodium reactors, 505-6
meltdown in fast reactors, 424-35
modification of DIDO, 154
neutron detectors in, 329-31
neutron monitors in power reactors, 182-84
radiation monitoring in, 331-32
reactivity of Hallam, 241-42
sensors in, 330-31
spray cooling, 338-43
spray ring repair in Elk River Reactor, 487
temperature measurement in, 331
testing in SRE, 159
Reactor cover gas systems
performance of He, in NPD Reactor, 110
Reactor evaporators
leakage in Elk River Reactor, 486-87
Reactor excursions, 20-25, 33, 164, 250-52
Reactor fuel coatings
fission-product retention, 311
Reactor fuel reprocessing plants
licensing, 131-32, 300-1
Reactor fueling systems
NPD Reactor, 108-9, 111
Reactor fuels
burnup distributions, nonuniform, 156
burst-slug detection, 451
cladding-defect detection, 511-13
critical position in ORR, 156
damage by SRE power excursion, 280-81
destructive testing in PBF, 499
failure in BONUS Reactor, 113-18
failure in ORR, 280
failure, fission-product behavior upon, 401-2
fission-product release from failed, in PRTR, 158
location in TREAT using neutron detectors, 429-30
meltdown, 73-74
meltdown in EBR-II, 50
meltdown in Fermi Reactor, 50
meltdown in Hallam Reactor, 50
meltdown in HTRE-3, 280
meltdown in ML-1, 50
meltdown in NSPP, 253-54
meltdown in ORR, 158
meltdown in SRE, 50
modification of DIDO, 154
performance of booster rod in NPD Reactor, 110
performance limitations, 302-11
radiation monitoring for failed, 331-32
radioiodine release, 72-80
reactions with Na, 405
reactions with water, 400
reloading in Elk River Reactor, 487
shipping, 508
spray cooling, 338-43
testing for Fast Ceramic Reactor, 509
Reactor fuels (adjusted U)(irradiated)
swelling, 302-3
Reactor fuels (Al alloy (6061)-clad)
reaction with steam, 30-31
reaction with water, 32
Reactor fuels (Al–Ni–U)
reaction with steam, 30-31
Reactor fuels (Al–Ni–U)(irradiated)
reaction with water, 32
Reactor fuels (Al–U)
reaction with water, 32
testing in SPERT, 445-47
Reactor fuels (Al–U)(irradiated)
radioiodine release, 76
Reactor fuels (Al–U3O8)
ignition, 170
Reactor fuels (CaO–UO2–ZrO2)
use in PBF, 447
Reactor fuels (ceramic)
meltdown, 432
Reactor fuels (clad)
defect detection, 511-13
Reactor fuels (coated-particle)
development, 310-11
Reactor fuels (Fe–Pu–U)
ignition, 169
Reactor fuels (irradiated)
fission-product release, 252-53
handling, 69
storage, 67-72
Reactor fuels (metallic)
compatibility with CO2, Na, and H2O, 303
ignition, 169
meltdown, 431-32
Reactor fuels (mixed-oxide)
meltdown, 432
Reactor fuels (Mo–Pu–U)
ignition, 169
Reactor fuels (Mo–U)(irradiated)
swelling, 303
Reactor fuels (PuO2–UO2)
development, 306-7
oxidation, particles produced by, 470
response to power excursions, 250-51
thermal conductivity, 306
venting, 254, 307
Reactor fuels (PuC–UC)
venting, 307
Reactor fuels (PuC-UC)(irradiated)
behavior and thermal conductivity, 308
Reactor fuels (Pu oxide)
aerosols formed upon vaporization of, 253
Reactor fuels (PyC-coated-particle) (irradiated)
fission-gas release, 311
Reactor fuels (SiC-coated-particle) (irradiated)
fission-gas release, 311
Reactor fuels (spent)
Pu release control during reprocessing, 255-56
reprocessing, licensing of plants for, 131-32, 511
Reactor fuels (SS-clad)
transient tests in SPERT-III, 445-46
Reactor fuels (SS-clad)(irradiated)
bending of TRIGA, 154-55
Reactor fuels (SS(304)-clad)
reactions with steam and water, 29-30

Reactor fuels (SS-UO_2)(irradiated)
activity release from defected, in BORAX-V, 157-58
radioiodine release from, 253
Reactor fuels (Th–U)
meltdown, 431-32
Reactor fuels (ThO_2–UO_2)
development, 306-7
Reactor fuels (ThO_2–UO_2)(irradiated)
fission-gas release, 305
sintering, 306
swelling, 306
Reactor fuels (ThO_2–UO_2 particle)(PyC-coated)(irradiated))
microstructure and stability, 310
Reactor fuels (U)
reaction with water, 27
thermal conductivity, 309
Reactor fuels (U)(irradiated)
radioiodine release, 253
swelling, 302-3
Reactor fuels (U)(Mg-clad)
combustion, 169
Reactor fuels (U)(Zr-clad)
reaction with water, 33-34
Reactor fuels (UC_2 particle)(PyC-coated)(irradiated)
behavior, 310-11
Reactor fuels (UO_2)
Cs release, 501
development, 303-6
meltdown, 432
thermal conductivity, 309
transient tests in SPERT-I, 444-45
Reactor fuels (UO_2) (irradiated)
behavior, 303-6
fission-product release, 34-42, 304-5, 501
Reactor fuels (UO_2)(SS-clad)
reaction with steam, 29
Reactor fuels (UO_2)(SS-clad)(irradiated)
behavior, 303-6
fission-product release, 253, 501-2
Reactor fuels (UO_2)(Zy-clad)(irradiated)
behavior, 303-6
fission-product release, 253, 501-2
Reactor fuels (UO_2)(Zy-2-clad)
reaction with water, 27-29
Reactor fuels (UO_2)(Zy-2-clad)(irradiated)
fission-product release, 501
Reactor fuels (UO_2 particle)(PyC-coated)(irradiated)
behavior, 310-11
Reactor fuels (UC)
compatibility with SS and Zy cladding, 307-8
melting point, 309
properties of sintered, 308
stoichiometry, 307-8
thermal conductivity, 309
Reactor fuels (UC)(clad)
meltdown, 432
Reactor fuels (UC)(irradiated)
properties, 308
radioiodine release, 253
Reactor fuels (UN)
properties, 309
Reactor fuels (UN)(irradiated)
dimentional stability and fission-gas release, 309
Reactor fuels (UP)
fabrication and properties, 309-10
Reactor fuels (UP)(irradiated)
behavior, 310
Reactor fuels (US)
fabrication and properties, 309-10
meltdown, 432
Reactor fuels (US)(irradiated)
behavior, 310
Reactor fuels (U oxide)(Zy-2-clad)(irradiated)
performance in NPD Reactor, 110
Reactor fuels (vented)(irradiated)
failure, 506
Reactor fuels (Zy-4-clad)
reaction with water, 504-5
Reactor fuels (ZrC-coated-particle)(irradiated)
fission-gas release, 311
Reactor generators
operation in Elk River Reactor, 488-89
performance of diesel, in NPD Reactor, 109
Reactor heat exchangers
failure in Hallam Reactor, 238-39
replacement of, in SRE, 159
Reactor instrumentation, 45-62, 153, 175-84, 324-33, 449-58
core meltdown experiments, 429-30
failures at Harwell, 328
HFIR, 329
human engineering, 333
neutron-source tubes, 332
operation in Elk River Reactor, 489-90
radiation protection at CVTR, 142-43
reliability, 329
thermocouples, 157, 332
Reactor kinetics, 162-65, 250-52, 398-99, 451, 499, 505-7
Reactor licensees
indemnification, 122, 124
Reactor loops
in-pile gas, 165-69
rupture-loop failure in PRTR, 242-47
Reactor materials
combustion and ignition, 169-72
Reactor moderators
annealing of BGRR graphite, 155
boiling detection in water, 452-56
dumping of D_2O for shutdown, 49, 51
element cladding failure in Hallam Reactor, 157, 240-41
loss in Piqua Reactor, 50
oxidation of graphite, 170-71
properties of water, boiling effects on, 455
properties of water, bubble effects on, 454-55
sorption of radioiodine by graphite, 76
Reactor moderators (irradiated)
defect traps in graphite, 36
oxidation of graphite, 170, 254
properties of graphite, 318-23
Reactor operators
licensing and regulation, 270, 297-301
performance, 408
study, 509
training, 148, 151
Reactor piping
corrosion in Elk River Reactor, 489
fittings in NPD Reactor, 109
rupture, 185-94, 249, 399, 499-500
welding of Agesta, 159
Reactor poisons
$Gd(NO_3)_3$ use in Savannah River reactors, 153-54, 175-79
use in Peach Bottom Reactor, 49
Reactor pressure tubes
performance of Zy, in NPD Reactor, 109-10
Reactor primary systems
integrity, 499-501
operation in Elk River Reactor, 489-91
Reactor pumps
performance in ATR, 155
performance in Hallam Reactor, 239-40
performance in NPD Reactor, 109
Reactor recorders
faults in U. K., 291
Reactor relays
faults in U. K., 290
Reactor safety, 67-86, 185-217, 338-53
in U. S. S. R., 159-61
in U. K., 281-92
Reactor Safety Committee
functions at CVTR, 146
Reactor-Safety Research Committee
functions, 121-22
Reactor Safety Review Committee
functions and purposes at ANL, 2-4
Reactor safety rods
calibration of Fermi, 155-56
Reactor safety systems
design, 153, 452
NPD Reactor, 104, 106-7, 111-12
performance, 153
Reactor scrams
summary of, in Hallam Reactor, 241
Reactor shutdown systems
secondary, in power reactors, 45-52
Reactor siting
engineered safeguards effects on, 342-46
evaluation, 73
geohydrologic aspects, 508
off-shore, 404, 503-4
Reactor steam generators
operation in Elk River Reactor, 488-89
operation in Hallam Reactor, 240
Reactor superheaters
failure in BONUS Reactor, 113-18
operation in Elk River Reactor, 487-88
Reactor thermocouples
operation, 332
use in Elk River Reactor, 157
Reactor transients
tests in SPERT-III, 251
Reactor tubes
checking of, in Hanford Production Reactors, 158
Reactor turbines
performance in NPD Reactor, 107-8
Reactor wastes
control in U.S.S.R., 160
Reactors
(see also Accidents, Critical assemblies, and Systems for Nuclear Auxiliary Power)
air cleaning systems, 252, 343, 403-4
bubble noise, 454-55
design criteria, 416-17
Doppler effect, 251, 399
engineered safeguards, 76-78, 81-86, 342-46
faults in U. K., 281-92
fire extinguishing, 172
incident evaluation, 279-92
licensing and regulation, 118-22, 257-67, 385-95, 513-21
neutron-flux measurement, 451
neutron-flux noise, boiling, 453-55
noise analysis, 271-78
operation, 148-58, 257
power supplies, 324-28
pulsed neutron experiments, spatial effects in, 163-64
radiation exposure in environs of, 371
radiation monitoring of gaseous effluents, 332
shutdown margin, 271-73
simulation, 451
stability, 250-52
steam quality in Elk River Reactor, 490
Reactors (Advanced Test)
burnout tests for, 440-41

pump performance and prestartup testing, 155
Reactors (Aerospace Systems Test)
control rods, spring-actuated, 154
Reactors (Agesta)
rewelding of pipes, 159
Reactors (Air Force Nuclear Engineering Test Facility)
testing, hydraulic, 155
Reactors (Big Rock Point)
containment system design and leak testing, 194-203
engineered safeguards, 343-45
fuel, handling of irradiated, 69
licensing and regulation, 126, 258, 386, 514
repair, 158-59
shutdown system, secondary, 45-48
Reactors (Boiling Nuclear Superheater)
containment system design and leak testing, 194-203
control rod testing, 57, 60-61
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68-72
licensing and regulation, 124, 126, 258, 260-61, 385-86, 388, 513-14, 516-17
shutdown system, secondary, 45-48
superheater failure, 113-18
Reactors (Boiling Reactor Experiments)
activity release from defected fuel, 157-58
power excursions, 20-25
Reactors (boiling-water)
design criteria, 416-17
engineered safeguards, 343-45
noise analysis, 274
shutdown systems, secondary, 49-50
spatial effects at power, 276-77
Reactors (Brookhaven Beam Research)
containment testing, 155
Reactors (Brookhaven Graphite)
Brookhaven Chemo-Nuclear In-Pile Research Loop, 165, 167-68
Reactors (Brookhaven Research)
graphite annealing, 155
Reactors (Brookwood 1)
licensing and regulation, 258, 261, 386, 514, 517-18
Reactors (Bulk Shielding)
subcritical reactivity, 273
Reactors (CABRI)
power excursions, 20
Reactors (Carolinas-Virginia Tube)
burnout tests for, 441
containment system design and leak testing, 194-203
coolant loss, 50-51, 382
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 125-26, 137-38, 258, 261, 386, 388, 514
operating experience, 375-83
radiation safety administration, 137-48
scram, 145
shutdown system, secondary, 45-51
startup problems, 155
Reactors (ceramic-fueled)
Doppler effect in, 314
Reactors (Colorado High-Temperature Gas-Cooled)
licensing and regulation, 259, 261
Reactors (Connecticut Yankee)
engineered safeguards, 82-83, 85, 343-45
licensing and regulation, 126, 258, 386, 514
Reactors (DIDO)
power-level increase, 154
radioiodine deposition in, 75-76
Reactors (Douglas Point)
D_2O dumping for shutdown, 49
Reactors (Dounreay Fast)
boiling detection, 454
noise measurements, 276
Reactors (Dounreay Materials Testing)
boiling detection, 454
flux noise, 276
Reactors (Dresden)
control rod testing, 57-59
engineered safeguards, 343-45
shutdown system, secondary, 45-48
spatial effects at zero power, 273
stability tests, 277
Reactors (Dresden 1)
licensing and regulation, 126, 258, 261, 386, 514
operation, 257
Reactors (Dresden 2)
licensing and regulation, 258, 261-62, 386, 388-89, 514
Reactors (Dresden 3)
licensing and regulation, 389, 514
Reactors (EDF)
control rod release, 49
Reactors (Elk River)
containment system design and leak testing, 194-203
control rod testing, 57, 60-61
fuel, handling of irradiated, 69
fuel, storage of irradiated, 70-72
licensing and regulation, 126, 258, 386, 514
noise analysis, 276
operation, 482-85
shutdown system, secondary, 45-48
spatial noise sources, 277
thermocouple equipment, 157
Reactors (Engineering Test)
fission-break incident, 280
fuel, storage of irradiated, 70-72
Reactors (Experimental Boiling Water)
boiling detection, 453-54
control rod testing, 57, 60-61
licensing and regulation, 126, 258, 386, 514
noise analysis, 271
Reactors (Experimental Breeder 2)
containment testing, 155
control-rod failure, 159
fuel meltdown, 424-25, 431-32
fuel, storage of irradiated, 68, 70-72
licensing and regulation, 126, 258, 386, 514
operator training, 151
shutdown, 45-50
Reactors (Experimental Gas Cooled)
containment system design and leak testing, 194-203
coolant loss, 50
engineered safeguards, 77-78
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 126, 258, 386, 389
pulsed source experiments, 164
shutdown, 45-50
Reactors (fast)
Doppler effects in, 313-18
failed-fuel detection, 332
meltdown in, 424-35
in U.S.S.R., 161
Reactors (Fast Ceramic)
fuel testing, 509
venting of PuO_2–UO_2 fuel, 254
Reactors (fast sodium)
accident analysis, 405-6
fission-product retention by Na, 406
safety studies, 505-7
Reactors (Fermi)
containment system design and leak testing, 194-203
control rod calibration, 155-56
fuel, handling of irradiated, 69
fuel meltdown, 424-25, 431
fuel, storage of irradiated, 68, 70-72
licensing and regulation, 125-26, 258, 262, 386, 389, 514
safety rod calibration, 155-56
shutdown, 45-50
Reactors (Ford)
power determination, 156
Reactors (G-2)
control rod release, 49
depressurization, 280
Reactors (G-3)
control rod release, 49
Reactors (Garigliano)
power distribution monitoring, 156
Reactors (gas-cooled)
fission-product behavior, 406
kinetics, 507
shutdown systems in France, 49
shutdown systems in U. K., 49-50
Reactors (General Electric Test)
containment system design and leak testing, 194-203
control-rod vibration, reduction of, 158
fuel, storage of irradiated, 70-71
General Atomic In-Pile Loop, 166-69
licensing and regulation, 125, 128, 389-90, 518
neutron noise, 275
Reactors (Hallam)
containment system design and leak testing, 194-203
control rod testing, 57, 60-61
core reactivity, 241-42
fuel, handling of irradiated, 69
fuel, storage of irradiated, 70-72
licensing and regulation, 126, 128, 258, 386, 514
moderator-element cladding failure, 157, 240-41
operation, 236-42
shutdown, 45-50
Reactors (Hanford production)
monitoring of waste releases, environmental, 230
shutdown system, secondary, 49-50
tubes, checking of process, 158
Reactors (Heat Transfer Reactor Experiment 3)
fuel-element meltdown in, 280
Reactors (Heavy Water Components Test)
containment system design and leak testing, 194-203
corrosion of mild steel in cooling system, 154
engineered safeguards, 77-78
fuel, storage of irradiated, 69-71
repair, 158
safety system, 153
shutdown system, secondary, 45-48
Reactors (heterogeneous water)
Doppler coefficient measurement, 399
kinetics, 398-99, 499
Reactors (high-flux)
burnout predictions, 440
Reactors (High Flux Beam Research)
licensing and regulation, 262-63
Reactors (High Flux Isotope)
control, 329
instrumentation, 329
licensing and regulation, 128
testing, hydraulic, 155
Reactors (High-Temperature Gas-Cooled)
fission-product behavior in, 507

graphite oxidation, irradiated, 254
Reactors (Humboldt Bay)
containment system design and leak testing, 194-203
engineered safeguards, 77-78, 343-45
fuel, storage of irradiated, 68, 70-72
licensing and regulation, 126, 128-29, 258, 263, 386, 390, 514, 518
Reactors (Humboldt Bay 3)
fuel-cladding defect detection, 511-13
operation, 257
shutdown system, secondary, 45-48
Reactors (Indian Point)
containment system design and leak testing, 194-203
control rod testing, 57-59
engineered safeguards, 343-45
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 126, 129, 258, 263
maintenance, 157
operation, 257
shutdown system, secondary, 45-48
Reactors (Indian Point 1)
licensing and regulation, 386, 514
Reactors (Indian Point 2)
licensing and regulation, 390, 514, 518
Reactors (Industrial Radiation Laboratory)
pneumatic rabbit facility design, 153
Reactors (La Crosse)
engineered safeguards, 343-45
licensing and regulation, 127, 259, 386, 514
Reactors (light-water)
accident analysis, 400-1, 501
containment, 404
core spray cooling, 338-42
development, 498-505
fission-product behavior, 401-4
hazards evaluation, 408
kinetics, 398-99
primary system integrity, 399-400
safety test experiment programs, 404-5
Reactors (Loss of Fluid Test)
fission product behavior, 79
H_2 deflagration, 501
metal-water reactions in, 33-34
progress, 249-50, 504-5
Reactors (Malibu)
accident, pressure transient following maximum credible, 82-83
containment, 83-85
engineered safeguards, 82-83, 343-45
licensing and regulation, 126, 129-30, 259, 387, 514
Reactors (Materials Testing)
fuel, storage of irradiated, 70-72
Reactors (Millstone Point)
licensing and regulation, 130, 258, 263-64, 387, 515, 518-19
Reactors (Mobile Low Power Plant 1)
fuel, storage of irradiated, 68, 70-72
operation, 151
shutdown, 45-50
Reactors (New Production)
licensing and regulation, 127, 259, 387, 515
Reactors (Nine Mile Point)
containment, 83, 85
engineered safeguards, 343-45
licensing and regulation, 127, 259, 387, 515
Reactors (Nuclear Power Demonstration)
D_2O dumping for shutdown, 49
performance, 104-13
Reactors (NRU)
computer and neutron detector use in, 329-30
Reactors (NRX)
accident, 281
Reactors (N. S. Savannah)
containment system design and leak testing, 194-203
engineered safeguards, 77-78
licensing and regulation, 127, 130, 259, 387, 391, 515
shutdown system, secondary, 45-48
Reactors (Oak Ridge Research)
criticality, 156
fuel-failure incident, 280
fuel-failure studies in, 253
fuel meltdown, 158
fuel, storage of irradiated, 69-71
GCR-ORR Loop 2, 165-69
loss-of-coolant accident simulation, 29
Reactors (OSIRIS)
power excursions, 20, 24
Reactors (Oyster Creek)
containment, 83-86
engineered safeguards, 343-45
licensing and regulation, 127, 259, 387, 515
Reactors (Pathfinder)
containment system design and leak testing, 194-203
engineered safeguards, 343-45
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 127, 130-31, 259, 264, 387, 391-92, 515
shutdown system, secondary, 45-48
Reactors (Peach Bottom)
containment system design and leak testing, 194-203
control rod testing, 57-59
coolant loss, 50
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 127, 259, 264, 387, 392, 515
shutdown system, secondary, 45-51
Reactors (Piqua)
containment system design and leak testing, 194-203
control rod testing, 57, 60-61
coolant loss, 50
fuel, handling of irradiated, 69
fuel, storage of irradiated, 70-71
licensing and regulation, 127, 131, 259, 387, 392, 515
moderator loss, 50
shutdown, 45-50
Reactors (Platteville)
licensing and regulation, 387, 515
Reactors (Plum Brook)
containment system design and leak testing, 194-203
Reactors (PLUTO)
radioiodine deposition in, 75-76
Reactors (Plutonium Recycle Test)
containment system design and leak testing, 194-203
coolant loss, 50
fission-product release from failed fuel, 158
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
O_2 recombination in, 154
radiation measurement during shutdown, 158
rupture-loop failure, 242-47
shutdown, 45-50
Reactors (Portable Medium Power Plant 1)
shutdown system, secondary, 45-48
Reactors (Portable Medium Power Plant 2A)
radiation effects on vessel, 500
shutdown system, secondary, 45-48
Reactors (Portable Medium Power Plant 3A)
refueling, 158
shutdown system, secondary, 45-48
Reactors (power)
containment, 83-86
control, computer use in, 456-58
core meltdown, 425
design criteria, 416
dynamic behavior, flux-shape change effects on, 164
electrical systems, interference in, 332
engineered safeguards, 343-45
neutron monitors for, in-core, 182-84
noise analysis, 271, 273-77
operation, 257, 509
operator licenses granted, 297-98
performance evaluation, 509
primary-system noise at power, 275-76
radiation monitoring, 408
safety experience, 408
shutdown systems, secondary, 45-52
siting, off-shore, 248, 503-4
spatial effects at power, 276-77
spatial effects at zero power, 273-74
system reliability, 408
Reactors (Power-Burst Facility)
development, 251, 398, 447
Doppler effect in, 499
fission-product behavior in, 79
testing of fuel assemblies, destructive, 499
Reactors (pressurized-water)
design criteria, 416-17
engineered safeguards, 343-45
power excursions in, 251
shutdown systems, secondary, 49-50
Reactors (Puerto Rico Nuclear Center)
licensing and regulation, 392-93
Reactors (Ravenswood)
containment, multiple, 84
Reactors (research)
fuel, handling of irradiated, 69
operator licenses granted, 297-98
Reactors (San Onofre)
containment, 83, 85
engineered safeguards, 82-83, 343-45
licensing and regulation, 127, 259, 264, 387, 515
Reactors (Savannah River)
burnout predictions, 440
computers, use of on-line, 153
$Gd(NO_3)_3$ use as poison, 153-54, 175-79
shutdown system, secondary, 49
Reactors (Saxton)
containment testing, 155
licensing and regulation, 127, 131, 259, 387, 515
neutron-flux noise, 454
shutdown system, secondary, 45-48, 50
Reactors (Shippingport Pressurized Water Reactor)
containment system design and leak testing, 194-203
engineered safeguards, 343-45
licensing and regulation, 127, 259, 387, 515
operation, 257
shutdown system, secondary, 45-48
Xe power oscillations, 162
Reactors (SILOETTE)
power excursions, 20, 25
Reactors (SNAPTRAN)
fission product behavior, 79
Reactors (SNAPTRAN-2)
destruct test, 407
Reactors (Na-cooled)
boiling, 251, 506

Reactors (Sodium Reactor Experiment)
cold traps, 153
core testing, 159
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
heat-transfer system, replacement of, 159
licensing and regulation, 127, 259, 387, 515
noise analysis, 274
power excursion, 280-81
shutdown, 45-50
Na system components performance, 157
Reactors (Southwest Experimental Fast Oxide)
fuel meltdown, 432
licensing and regulation, 127, 131, 259, 387, 393-94, 515
Reactors (Soviet), 159-61
Reactors (Special Power Excursion Reactor Tests)
(see also Capsule Driver Core)
Al alloy (6061) fuel cladding reaction with steam, 30-31
Al alloy (6061) fuel cladding reaction with water, 32
computer programs, 251-52
kinetics, 398-99
metal-water reaction during excursion accident, 33
power excursions, 20, 24-25
program status, 443-48
subassembly testing, 251
Reactors (Special Power Excursion Reactor Tests-I)
Doppler feedback in core, 499
Reactors (Special Power Excursion Reactor Tests-II)
departure from nucleate boiling, 156
Reactors (Special Power Excursion Reactor Tests-III)
operation, 156-57
static test program, 498
transient tests in, 251
Reactors (Special Power Excursion Reactor Tests-IV)
computer programs and core dynamics studies, 498-99
Reactors (Stationary Low Power Plant 1)
accidents, 24
Al-Ni-U alloy fuel reaction with steam, 30-31
Al-Ni-U alloy fuel reaction with water, irradiated, 32
metal-water reaction during excursion accident, 33
Reactors (Stationary Medium Power Plant 1)
containment system design and leak testing, 194-203
shutdown system, secondary, 45-48
Reactors (Stationary Medium Power Plant 1A)
containment system design and leak testing, 194-203
shutdown system, secondary, 45-48
Reactors (Stationary Medium Power Plant 2)
burnout predictions, 440
Reactors (Steam-Generating Heavy-Water)
failed-fuel detection, 331-32
Reactors (TARGET)
fuel design, coated-particle, 311
Reactors (test)
fuel burnup distributions, nonuniform, 156
Reactors (Transient Reactor Test Facility)
core-meltdown program, 426-31
experiments in, 253
fission-product release, 401-2
metal-water reactions in, 27-30, 32-34, 400
Reactors (TRIGA)
bending of irradiated SS-clad fuel elements, 154-55
Reactors (TRITON)
power excursions, 20, 24
Reactors (Turkey Point 3)
licensing and regulation, 519
Reactors (Turkey Point 4)
licensing and regulation, 519
Reactors (United Kingdom)
control-rod release, 49-50
incidents, 152
safety evaluation, 281-92
Reactors (University of Michigan)
core design, 154
Reactors (University of Virginia)
licensing and regulation, 294-95
Reactors (Vallecitos Boiling Water)
noise analysis, 277
shutdown system, secondary, 45-48
Reactors (Vallecitos Experimental Superheat)
licensing and regulation, 127, 259, 264, 387, 394, 515
Reactors (water-cooled)
metal–water reactions, 25-34
piping system, rupture of primary, 185-94
Reactors (water-moderated)
boiling detection, 452-56
shutdown system, secondary, 49-50
Reactors (White Sands Fast Burst)
description, 153
Reactors (Windscale)
radioiodine behavior in accident, 72
Reactors (Wylfa)
computer use in, 330
Reactors (Yankee)
containment system design and leak testing, 194-203
control rod testing, 57, 60-62
engineered safeguards, 343-45
fuel, handling of irradiated, 69
fuel, storage of irradiated, 68, 70-71
licensing and regulation, 127, 259, 387, 515, 519-20
operation, 156, 257
pressure vessel failure, 519-20
shutdown system, secondary, 45-48, 50
Reactors (ZENITH)
radioiodine deposition in, 75
Regulations
(see also Code of Federal Regulations and Licensing and regulation)
ANL, 1-6
contaminants, threshold limits for atmospheric, 89-92
national and international, 415-17
procedures at CVTR, 141, 143-44
reactor site evaluation, 73
shipping of radioactive materials, 409-13
Regulatory Review Panel
reactor licensing recommendations, 119-21
Reports (safeguards), 134
Research (medical)
radioactive material handling and disposal in, 474-76
Research and development
progress summaries, 247-57, 397-407, 498-509
Rivers
analysis of Columbia, for radioisotopes, 256
population radiation dose from wastes in Clinch, 256
radioisotope behavior in, 255, 408
sampling, 53
waste dispersion in, 508
Rodents
population studies using ^{45}Ca, 96-97
Rubber (chlorinated)
sorption of radioiodine, 76
Rubidium-86
cycling in ecosystems, 94

S

Safeguards (engineered)
effects on reactor siting, 342-46
reactor containment systems, 76-78, 81-86
Safeguards reports, 134
Salt formations
waste disposal in, 256
Sampling
wastes, 52-56
Sedan Project
fallout retention by plants, 93-94
Shells
nozzles in spherical, 255, 400, 500
strength of steel, 204-12, 346-53
Shielding
for in-pile loops, 167-68
Shipping
collisions, 507
radioactive materials, 248, 396-97, 406, 409-13
reactor fuels, 508
wastes, 507
Shipping containers
evaluation, 248-49, 507-8
Silicon-32
detection in environs, 93
Silicon monocarbide coatings
fission-gas retention, 311
Silver
sorption of radioiodine, 75-76
Snow
washout by, 358-60
Sodium
autoignition temperatures, 172
boiling, 251, 405, 506
burning, 172, 252, 405-6
compatibility with metallic reactor fuels, 303
cycling in ecosystem, 94
dissolution, 172
fires, 252, 506
fission-product behavior in, 253
fission-product release from, 252, 506-7
fission-product retention by, 252, 406, 506
reactions, 405-6
Sodium-22
detection in environs, 93
Sodium-24
detection in environs, 93
Soils
radioactivity decay in, neutron-induced, 96
radioisotopes in, 93-94
reactions of minerals in, with radiocesium, 99-100
reactions of minerals in, with radiostrontium, 99-102
Solutions
burnout in, 437
Source material
licensing and regulation, 134
Stack gases
radioiodine washout from, 359-60
Stainless steel
fatigue, 500
reactions with steam and water, 29-30

sorption of radioiodine, 76
Stainless steel aerosols (SS–U oxide)
behavior, 502-3
Stainless steel oxide mixtures (SS oxide–UO_2)
melting points, 29
Stainless steel piping
rupture, 185-86
Stainless steel system reactor fuels (SS–UO_2)(irradiated)
activity release from defected, in BORAX-V, 157-58
radioiodine release from, 253
Standards
national and international, 415-17
nuclear, 509
radiation protection, 132
radioactivity in U.S.S.R., 160
reactor piping systems, 191
safety system using $Gd(NO_3)_3$ solution in Savannah River reactors, 178-79
shipping of radioactive materials, 409-13
Steam
reaction with Al, 30-33
reaction with Al alloys, 30-31
reaction with SS, 29-30
Steam mixtures (air-steam)
methyl iodide removal from, 502
Steel (A-212B)(irradiated)
burst testing, 500
Steel (A-302B)
embrittlement in Yankee Reactor pressure vessel, 519-20
fatigue, 500
Steel (carbon)
fatigue, 500
Steel (Cr–Mo)
fatigue, 500
Steel (mild)
corrosion in HWCTR cooling system, 154
sorption of radioiodine, 76
Steel piping
rupture, 185-86
Steel reactor shells
strength, 204-12, 346-53
Storage
reactor fuels, irradiated, 67-72
solid wastes, 231-34
Strontium-85
cycling in ecosystems, 94-95
transport in model river, 255
Strontium-89
protective guides for environmental contamination by, 413-15
retention by plants, 94
Strontium-90
levels of deposition in U. S., 93
population radiation dose from, in Clinch River, 256
protective guides for environmental contamination by, 413-15
retention by plants, 95
Strontium radioisotopes
reactions with soil and clay minerals, 99-102
Sulfur-35
detection in environs, 93
Sulfur-38
detection in environs, 93
Systems for Nuclear Auxiliary Power 8
maintenance and shutdown, 157
Systems for Nuclear Auxiliary Power 10A
automatic startup and operation, 155

T

Tantalum
oxidation, 171
Tantalum boride powder
ignition, 171
Tantalum carbide powder
ignition, 171
Tantalum powder
ignition, 171
Tarrifs
shipping of radioactive materials, 409-11
Teletherapy programs
licensing guide, 270
Tennessee
regulatory authority, 134
Testing
ATR, prestartup, 155
BBRR containment, 155
EBR-II containment, 155
HFIR, hydraulic, 155
for leaks in reactor containment systems, 194-203
NETF, hydraulic, 155
reactor control rod drives, 57-62
reactor vessels, 399-400
safety system using $Gd(NO_3)_3$ solution in Savannah River reactors, 177-78
Saxton containment, 155
SRE core, 159
Thermocouples
operation in reactors, 332
use in Elk River Reactor, 157
use in reactor-core meltdown experiments, 429
Thorium alloys (Mg–Th)
licensing guide for processing, 270
Thorium dioxide particle reactor fuels (ThO_2–UO_2)(PyC-coated)(irradiated)
microstructure and stability, 310
Thorium dioxide system reactor fuels (ThO_2–UO_2)
development, 306-7
Thorium dioxide system reactor fuels (ThO_2–UO_2)(irradiated)
fission-gas release, 305
sintering, 306
swelling, 306
Thorium powder
ignition, 171
Thyroid
radiation dose to human, from ^{131}I in ingested milk, 367-70
Titanium boride powder
ignition, 171
Titanium carbide powder
ignition, 171
Titanium powder
ignition, 171
TNT
use in reactor-explosion containment studies, 459-68
Transducers
review of nuclear, 179-84
use of pressure, in reactor-core meltdown experiments, 429
Transportation
(see Shipping)
Tritium
hazards in NPD Reactor, 112-13
levels in Elk River Reactor coolant, 492
levels in plants and water, 95-96
uptake prevention at CVTR, 141
Tungsten
oxidation, 171
Tungsten boride powder
ignition, 171
Tungsten carbide powder
ignition, 171
Tungsten powder
ignition, 171

U

Union of Soviet Socialist Republics
reactors, 159-61
United Kingdom
reactor accidents, 152
reactor safety evaluation, 281-92
reactor shutdown, 49-50
United States
nuclear standards, 415-16
^{90}Sr deposition levels, 93
University of Virginia
radiation safety, 292-96
Uranium
ignition and particle size of combustion products, 169
licensing guide for processing, 270
reaction with water, 26-27
Uranium-233
handling at ANL, 5
Uranium-235
handling at ANL, 5
Uranium (irradiated)
defect traps, 36
ignition, 169
oxidation, 169
radioiodine release from molten, 502
Uranium (UAl_3-coated)
oxidation, 169
Uranium alloy reactor fuels (Al–Ni–U)
reaction with steam, 30-31
Uranium alloy reactor fuels (Al–Ni–U) (irradiated)
reaction with water, 32
Uranium alloy reactor fuels (Al–U)
reaction with water, 32
Uranium alloy reactor fuels (Al–U) (irradiated)
radioiodine release, 76
Uranium alloy reactor fuels (Fe–Pu–U)
ignition, 169
Uranium alloy reactor fuels (Mo–Pu–U)
ignition, 169
Uranium alloy reactor fuels (Mo–U) (irradiated)
swelling, 303
Uranium dicarbide (irradiated)
defect traps, 36
Uranium dicarbide particle reactor fuels (PyC-coated)(irradiated)
behavior, 310-11
Uranium dioxide
fission product release, 253
thermal conductivity, 306
Uranium dioxide (irradiated)
properties, 34-42
thermal conductivity, 305
Uranium dioxide mixtures (SS oxide–UO_2)
melting points, 29
Uranium dioxide particle reactor fuels (PyC-coated)(irradiated)
behavior, 310-11
Uranium dioxide particle reactor fuels (ThO_2–UO_2)(PyC-coated)(irradiated)
microstructure and stability, 310
Uranium dioxide particles
production, 470
Uranium dioxide reactor fuels
Cs release, 501
development, 303-6
thermal conductivity, 309
Uranium dioxide reactor fuels (irradiated)
behavior, 303-6
fission-product release, 34-42, 304-5, 501
Uranium dioxide reactor fuels (SS-clad)
reaction with steam, 29
Uranium dioxide reactor fuels (SS-clad) (irradiated)

behavior, 303-6
fission-product release, 253, 501-2
Uranium dioxide reactor fuels (Zy-clad) (irradiated)
behavior, 303-6
fission-product release, 253, 501-2
Uranium dioxide reactor fuels (Zy-2-clad)
reaction with water, 27-29
Uranium dioxide reactor fuels (Zy-2-clad) (irradiated)
fission-product release, 501
Uranium dioxide system reactor fuels (PuO_2–UO_2)
development, 306-7
oxidation, particle production by, 470
response to power excursions, 250-51
thermal conductivity, 306
venting, 254, 307
Uranium dioxide system reactor fuels (SS-UO_2)(irradiated)
activity release from defected, in BORAX-IV, 157-58
radioiodine release from, 253
Uranium dioxide system reactor fuels (ThO_2–UO_2)
development, 306-7
Uranium dioxide system reactor fuels (ThO_2–UO_2)(irradiated)
fission-gas release, 305
sintering, 306
swelling, 306
Uranium monocarbide
I diffusion in, 253, 502
Uranium monocarbide reactor fuels
compatibility with SS and Zy cladding, 307-8
melting point, 309
properties of sintered, 308
stoichiometry, 307-8
thermal conductivity, 309
Uranium monocarbide reactor fuels (irradiated)
properties, 308
radioiodine release, 253
Uranium monocarbide system reactor fuels (PuC–UC)
venting, 307
Uranium monocarbide system reactor fuels (PuC-UC)(irradiated)
behavior and thermal conductivity, 308
Uranium monocarbide systems (UC-UN-UO)
phase studies, 309
Uranium mononitride
oxidation, 170
Uranium mononitride reactor fuels
properties, 309
Uranium mononitride reactor fuels (irradiated)
dimensional stability and fission-gas release, 309
Uranium mononitride systems (UC-UN-UO)
phase studies, 309
Uranium monophosphide reactor fuels
fabrication and properties, 309-10
Uranium monophosphide reactor fuels (irradiated)
behavior, 310
Uranium monosulfide reactor fuels
fabrication and properties, 309-10
Uranium monosulfide reactor fuels (irradiated)
behavior, 310
Uranium monoxide systems (UC–UN–UO)
phase studies, 309
Uranium octoxide compacts (Al–U_3O_8)
ignition, 170
Uranium oxide aerosols (SS–U oxide)
behavior, 502-3
Uranium oxide reactor fuels (Zy-2-clad) (irradiated)
performance in NPD Reactor, 110
Uranium powder
ignition, 171
Uranium reactor fuels
reaction with water, 27
thermal conductivity, 309
Uranium reactor fuels (adjusted)(irradiated)
swelling, 302-3
Uranium reactor fuels (irradiated)
radioiodine release, 253
swelling, 302-3
Uranium reactor fuels (Mg-clad)
combustion, 169
Uranium reactor fuels (Zr-clad)
reaction with water, 33-34
Uranium systems
criticality studies of H_2-moderated, 418-23
Urinalysis
program at CVTR, 140-41

V

Virginia, University of
radiation safety, 292-96

W

Washout, 355-60, 366
Waste Solidification Engineering Prototype
equipment installation and testing, 256-57
Wastes
control in U. S. S. R., 160
dispersion in environment, 508
disposal at CVTR, 143, 381
disposal at Elk River Reactor, 492-93
disposal to environment, 256, 373-74
disposal system in Hallam Reactor, activity release from, 241
handling solid, 231-34
monitoring of releases, environmental, 230
population radiation dose from, in Clinch River, 256
radioisotope release during treatment of, 255
sampling, 52-56
shipping, 507
storage facility at Atomic Disposal Co., licensing and regulation of, 264-65
storage of solid, 231-34
Water
compatibility with metallic reactor fuels, 303
effects of condensed, on radioiodine deposition, 76
monitoring, 53-55, 70
reactions with metals and alloys, 25-34, 400, 504-5
sampling of surface, 53
use of spray and dousing systems in reactor containment systems, 77
waste dispersion in surface, 508
Water (heavy)
(see Heavy water)
Water systems
backflow prevention at ORNL, 333-36
Waterdrops
gas scavenging by, 359
Welding
pipes in Agesta Reactor, 159
Wells
sampling of test, 52-53
Workmen's compensation
for radiation injuries, 510-11

Y

Yttrium
oxidation, 171
Yugoslavia
radiation accident in critical assembly, 281

Z

Zircaloy-2
reaction with water, 27-29
Zirconium
reaction with water, 27-29, 33-34, 504-5
Zirconium alloys (Mg–Mn–Zr)
ignition, 171
Zirconium alloys (Mg–Zr)
ignition, 171
Zirconium beryllide
oxidation, 171
Zirconium boride powder
ignition, 171
Zirconium carbide powder
ignition, 171
Zirconium monocarbide coatings
fission-gas retention, 311
Zirconium powder
ignition, 171

LEGAL NOTICE

This journal was prepared under the sponsorship of the U. S. Atomic Energy Commission. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this journal, or that the use of any information, apparatus, method, or process disclosed in this journal may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this journal.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.